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Carol L. Forrest, P.E.¹, Sandra Mathews²

ABSTRACT

The California State Water Resources Control Board (State Board) originally issued a National Pollutant Discharge System (NPDES) permit for storm water discharges associated with construction activities in 1992. This NPDES permit was issued as a general permit, applicable throughout the state (with certain exceptions). The general construction permit was made site-specific by a discharger-developed Storm Water Pollution Prevention Plan (SWPPP). As with most NPDES construction storm water permits, monitoring requirements were limited to inspections. Sampling and analysis of discharges was not specifically required, but a Regional Water Quality Control Board (Regional Board) could require additional monitoring. In 1999, the State Board revised and reissued its construction general permit. While the 1999 permit significantly enhanced the erosion and sediment control descriptions and requirements, and expanded the inspection program, sampling and analysis was still not required. Environmental advocacy groups took exception to the absence of sampling requirements and sought relief in court to add sampling and analysis. In 2001, the State Board in response to the court order adopted a resolution requiring sampling and analysis of construction site runoff under two conditions. Turbidity and/or sediment sampling is required when construction site runoff enters water bodies determined to be impaired for sediment or turbidity. Sampling for non-visible pollutants is required when construction operations expose materials to storm water.

Sampling construction site runoff is a relatively new concept for NPDES permits. Only a few permits throughout the country require sampling and analysis for sediment-related pollutants, and California is one of the only permitting entities to require sampling for non-visible pollutants in construction site runoff. The added complexity of sampling runoff requires construction operators and erosion and sediment control professionals to expand their skill set.

The bottom line of the new California sampling and analysis requirements is a renewed emphasis on erosion and sediment control as well as proper materials management. In the instance of the non-visible pollutants, the requirements provide incentives for projects that eliminate exposure of construction materials management by reducing sampling requirements.

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REGULATORY BACKGROUND

The state of California is an NPDES-delegated state. This delegation allows the state permitting authority to issue NPDES permits that are required by the federal Clean Water Act. The State Board chose to develop general permits to implement the federal industrial storm water requirements. The definition of industrial activity included construction activities that disturb five or more acres (2 hectares) of land. Similar to the approach that U.S. EPA and other states took, California developed separate industrial and construction activity permits primarily because of the additional need to address erosion and sediment control issues for construction. The first generation of the general construction permit was issued by the State Board in 1992 (Order 92-08-DWQ, NPDES Permit Number CAS000002). The general construction permit was applicable throughout the state, except for certain watersheds, such as Lake Tahoe, where more restrictive requirements are needed to protect the special water body, and on Tribal lands, which remain directly regulated by U.S. EPA.

To comply with federal regulations, all NPDES permits must contain monitoring requirements. The monitoring program in the 1992 General Permit required construction site operators to conduct inspections of the Best Management Practices (BMPs) to determine if they were in-place and adequate. The permit specified that these inspections be conducted before a predicted rain event and following an actual rain event. Inspections had to be documented, and an annual compliance certification by the construction site operator was based on the inspection results. In 1999, The State Board renewed and modified the permit as Order 90-08-DWQ, NPDES Permit Number CAS000002. Order 99-08-DWQ (hereafter General Permit) expanded the monitoring program to require inspection every 24-hours during extended storm events in addition to the before- and after-storm inspections.

The San Francisco BayKeeper, Santa Monica BayKeeper, San Diego BayKeeper, and Orange Coast Keeper filed a petition for writ of mandate challenging the General Permit in Superior Court, County of Sacramento. The petition challenged the absence of sampling and analysis requirements on two issues. First, the permit failed to require monitoring of storm water discharges from construction projects that flow into water bodies listed as impaired for sediment-related pollutants. Second, the permit failed to require monitoring for pollutants that dischargers know or should know to occur on the construction site, that may not be detectable in storm water discharges by visual inspection.

The court concurred with the environmental advocacy groups on these two issues and on September 12, 2000, issued a judgment and writ of mandate directing the State Board to modify the provisions of the General Permit to remedy the deficiencies in the monitoring requirements. Pursuant to the court order the State Board adopted Resolution No. 2001-046, on April 26, 2001, which modified the General Permit. Finding 15 was added to the permit, and changes were made to Section A, Storm

Water Pollution Prevention Plan, and Section B, Monitoring Program and Reporting Requirements:

Finding 15. The Monitoring Program and Reporting Requirements are modified in compliance with a judgment in the case of San Francisco BayKeeper, et al. v. State Water Resources Control Board. The modifications include sampling and analysis requirements for direct discharges of sediment to waters impaired due to sediment and for pollutants that are not visually detectable in runoff that may cause or contribute to an exceedance of water quality objectives.

SAMPLING FOR SEDIMENT AND TURBIDITY

The new General Permit sampling and analytical requirements state that construction sites that directly discharge into waters that are impaired for sediment-related pollutants (sediment, silt, or turbidity) must conduct a sampling and analysis program to determine whether the discharges from the construction site are further impairing the receiving water.

To determine whether a construction project needs to develop a sampling program for sediment-related pollutants, two determinations must be made. First, it must be determined whether the construction site runoff will enter a water body identified on the 303(d) list as being impaired for sediment-related pollutants; and second, it must be determined whether the discharge from the construction site is a direct discharge into the impaired water body.

The results of the evaluation and the subsequent sampling strategy, if required, must be included the construction project SWPPP.

Impaired Waters

The Clean Water Act requires that states assess their waters (rivers, lakes, streams, etc.) for impairments of designated or beneficial uses. Waters determined to be impaired by the State Board are placed on a list, known as the "303(d) list," for the section of the Clean Water Act where the requirement is located. Each Regional Board develops a list of impaired waters through a public process. These lists are finalized by the State Board and sent on to U.S. EPA for approval. The State Board revises the 303(d) lists every three years. A list of the waters determined to be impaired for sediment-related pollutants was included in the General Permit as Attachment 3. Updates of the 303(d) lists can be found on the State Board web site, http://www.swrcb.ca.gov/tmdl/303d_lists.html.

Direct Discharges

Direct discharges are those that flow from the construction site directly into the impaired water. Construction site runoff that enters a tributary that is not on the 303(d) list, a municipal separate storm sewer system, or a separate storm water conveyance system where the flow is co-mingled with other off-site flows (i.e.,

discharges from other properties not part of the construction site), is not considered to be a direct discharge and is not subject to the monitoring requirements.

This direct discharge language is somewhat unusual in that most discharges subject to the Clean Water Act are interpreted under the "Tributary Rule" which ascribes to the tributaries the restrictions imposed upon the water body to which the tributary flows. Therefore, some Regional Boards may, through the authorities they have to require additional monitoring, choose to extend the sediment-related monitoring requirements to the tributaries.

Sampling logistics

Once the need for sampling sediment-related pollutants has been established, a sampling strategy must be developed. The strategy must identify the discharge points from the construction site into the receiving water, locations where samples will be collected, the frequency of sampling, and the pollutants to be measured in the samples. The strategy should also identify where and how the samples will be analyzed, quality assurance procedures, and other information that will facilitate field implementation of the sampling strategy.

The permit specifies that samples be collected from within the 303(d) listed receiving water body upstream of the construction site discharge and immediately downstream of the last point of discharge from the construction site. To fully evaluate a construction site's contribution of sediment-related pollutants to a receiving water body, and evaluate whether the BMPs are effective in controlling sediment-related pollutants a good sampling strategy should also consider the collection of samples from the direct runoff of the construction site before or as it enters the receiving water body.

Samples must be collected during the first two hours of a runoff event when that runoff enters the receiving water body. Samples must be collected anytime runoff occurs except after dark (sunset to sunrise). The General Permit limits the number of sampling events to a maximum of four per month.

Samples of runoff that enter water bodies that are listed as impaired for sedimentation or siltation, must be analyzed for Settleable Solids (mL/L) and Total Suspended Solids (mg/L) according to EPA 160.2. Samples may be analyzed for suspended sediment concentration (SSC) according to ASTM D3977-97 instead of, or in addition to, Total Suspended Solids.

Samples of runoff that enters water bodies that are listed as impaired for turbidity must be analyzed for turbidity per EPA 180.1 or analyzed in the field using a turbidity meter.

It is very important that consistent sampling and analysis methods are used for all sampling locations and that the locations can be safely accessed during inclement

weather. Personnel conducting the sampling need adequate training to meet the General Permit conditions and help assure the collection of valid samples.

Interpreting the data

Two of the General Permit requirements that guide the interpretation of sampling data are that:

- an effective combination of erosion and sediment control measures be implemented on the site at all times during the rainy season; and
- BMPs be implemented on the construction site to prevent a net increase of sediment load in storm water discharges relative to pre-construction levels.

Site inspections and observations before, during, and after storm events provide good information on whether the erosion and sediment control BMPs are effective at controlling off-site discharges of eroded materials. The sampling results help to confirm the visual observations.

The sampling results of the upstream and downstream of the construction site help to provide an understanding of the contribution of sediment to a water body from a construction site. Although the upstream (background) sample may not be representative of the pre-construction levels of sediment discharge it does provide a basis for comparison, especially as most sites do not have pre-construction runoff samples.

The nature of construction activity increases the potential for the discharge of sediment-related pollutants in runoff. A system of erosion and sediment control measures is required to reduce the potential for the construction-related accelerated erosion from resulting in the discharge of pollutants. If either visual observations or analytical results indicate an increase in sediment-related pollutants downstream of the construction site the source of the pollutants need to be identified and corrected as soon as possible. Corrections may be fairly simple, such as performing maintenance, repairing, or replacing a malfunctioning BMP. However, if there is no specific BMP that has malfunctioned, the system of erosion and sediment controls should be evaluated to determine if alternative or additional BMPs are needed.

SAMPLING FOR NON-VISIBLE POLLUTANTS

The General Permit requires that a sampling and analysis strategy be developed for pollutants that are not visually detectable that are potentially present in construction site runoff.

Similar to the sediment-related pollutants, an evaluation is required to determine whether construction operations are potentially introducing non-visible pollutants into storm water that discharges from the site. However, unlike the sediment-related

pollutant monitoring, all construction sites throughout the state, regardless of the water body, tributary, or storm drainage system to which runoff is discharged, are subject to these sampling and analysis requirements.

Potential storm water pollutants include materials used, stored, or spilled during the construction process, and materials used or stored in a manner during past land use activities that present the potential for them to be released, such as past spills or amendment applied to the soil.

If these materials or potentially contaminated soils are exposed to storm water runoff that discharges from the construction site, and the potential pollutant cannot be visually observed, then the storm water runoff must be sampled and analyzed for the pollutant in question or an indicator of the pollutant. If the site evaluation determines that potential non-visible pollutants are present, but are protected from exposure by BMPs (e.g., secondary containment, sheds), then sampling and analysis is not required but a sampling strategy is recommended in case of an accidental release or BMP failure.

A critical point is that if the potential pollutant is not exposed to storm water runoff then sampling and analysis need not be conducted. Exposure can be prevented through the use of aggressive materials management practices, such as keeping stored materials covered, avoiding certain activities during the rainy season, and controlling the types and quantities of materials stored on site. In cases in cases where pollutants may be bound up in the soil, the use of temporary erosion control and early implementation of permanent erosion control measures should be employed to limit exposure.

Once the need for non-visible pollutant sampling has been established, a sampling strategy must be developed. The strategy must be included in the SWPPP, even if it is only a contingency plan in the event that pollutants are inadvertently exposed.

Sampling logistics

The sampling and analysis strategy must describe the pollutants or indicators to be measured, the locations including a rationale for obtaining the uncontaminated (background) sample, and the sampling frequency. The strategy should also identify where and how the samples will be analyzed, quality assurance procedures, and other information that will facilitate field implementation of the sampling strategy.

Selection of sampling locations needs to be carefully considered based on the specific nature of the pollutant and trigger requiring the sampling. For contingency sampling, the strategy should contain a rationale for the selection of sampling locations, because these locations may need to be developed in the field in response to a BMP failure or spill. Samples need to be collected downstream of where the storm water contacts the potential pollutant and from a location unaffected by the potential pollutant. The locations for this sampling may be dynamic and affected by several factors, including: (1) the progress of construction, (2) the relocation of material storage

areas, and (3) whether the potential pollutant is widespread or localized. The uncontaminated (background) storm water sample can be collected immediately upstream of the material storage area or spill site. Alternatively, it may be more appropriate to select a reference location on the construction site that is similar in all regards except for the presence of the potential pollutant, or even the location where runoff initially enters the construction site, if the pollutant is widespread.

Samples must be collected during the first two hours of a runoff event when that runoff, which is exposed to a potential pollutant, is discharged off the construction site. Samples must be collected anytime runoff occurs except after dark (sunset to sunrise). There is no limitation on the number of sampling events.

Samples must be collected and analyzed for the potential pollutant to which the storm water has been exposed. The project SWPPP should identify the construction-related materials, soil amendments, and any historic contaminants. From this list in the SWPPP those pollutants that would not be visually detectable should be identified. For example, if red paint were spilled, it would be visually detectable. However, if paint thinner were spilled, it would not be visually detectable. Once the list of non-visible potential pollutants is developed the likelihood that these materials will be or might inadvertently be exposed to storm water runoff should be determined. This is the list of potential pollutants that may need to be analyzed in storm water samples during the course of construction. Some of these pollutants may have field tests or indicator parameters that can be used instead of time-consuming and expensive analytical laboratory measurements. The use of field measurements and indicator parameters is encouraged, because it allows for a more rapid response in the event that a release is identified by the test results.

As with the sediment-related pollutant sampling program, it is important that: (1) consistent sampling and analysis methods be used for all sampling locations and (2) locations be selected that can be safely accessed during inclement weather. Personnel conducting the non-visible pollutants sampling need training to meet the General Permit conditions and help assure the collection of valid samples. There is a greater chance with this type of sampling to introduce contaminants into the sample, which might not represent the actual quality of the storm water.

Interpreting the data

The General Permit requires that construction site runoff not cause or contribute to an exceedance of an applicable water quality standard in the receiving water. The sample data collected of construction site runoff helps a person to make this evaluation by allowing a comparison of the results the runoff samples affected by the potential pollutants with the sample that was not affected by the potential pollutants.

If the analytical results indicate an increased concentration in the non-visible pollutants in the runoff sample compared with the background sample, then the source(s) of the pollutants need to be identified and controlled as soon as possible. Controls may involve repairing or replacing a malfunctioning BMP or re-evaluating

the system of BMPs and implementing alternative or additional BMPs, if the system is not proving to be effective. When contact of a pollutant with storm water cannot be eliminated and the pollutant is contaminating storm water, the storm water should be retained on site, perhaps through a retention basin, and not discharged from the construction site.

CONCLUSION

California's new sampling and analysis requirements put increased emphasis on the need for an effective system of erosion and sediment control measures and aggressive materials management BMPs. Erosion and sediment control measures can limit not only the sediment-related pollutants in storm water discharges, but also the non-visible pollutants that may be associated with soil contamination from past land use practices. Good housekeeping and proper management of construction site materials so as to limit and eliminate their exposure to storm water can significantly reduce the need to conduct sampling and analysis and limit the likelihood that problems will be found when sampling does occur.

End note

As of the writing of this paper, the specifics of the sampling and analysis requirements are under legal challenge and could be changed in the future. Updates on these requirements should be posted on the State Board web site, <http://www.swrcb.ca.gov>, as they are available.

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